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Abstract

Despite its centrality to human thoughts and practices, aesthetics has largely been ignored in Web site design. Until recent years, studies begin to show that task-unrelated (aesthetic) qualities such as color, graphics and music can play an important role in enhancing both usage and enjoyment of information systems as well as improving work quality. However, research progress has been greatly impeded by the lack of a conceptual framework for understanding aesthetics as well as empirically verified instrument to measure Web site aesthetics. Our research objective is to provide a sound theoretical framework of Web site aesthetics as well as a validated instrument to measure it. Based on extensive literature review on aesthetics in environmental psychology and Human-Computer Interaction (HCI), we propose a two-dimensional structure of Web site aesthetics concept in a cognitive-affective framework and develop a Web site aesthetics instrument in the context of electronic shopping. Initial item development, statistical analyses, and validity assessment (reliability, convergent validity, and discriminant validity) are described here in details. The contribution of this effort is twofold: First, it integrates theories from different domains to help us understand the concept of Web site aesthetics. Second, an instrument is provided for Web site aesthetics, which will facilitate future research in this field.

Keywords: Web Site Aesthetics, Visual Appeal, Organization.

1 INTRODUCTION

Despite its centrality to human thoughts and practices, aesthetics has largely been ignored in website design. Many authors place emphasis on usability features of websites, with little regard of the importance of visual aesthetics (Zettl 1999). Until recently, empirical studies reveal that aesthetics affects consumers' perceptions of Web site qualities (van der Heijden 2003) and it is one of the most important determinants of Web site preference (Schenkman & Jonsson 2000). However, among the small number of HCI studies that do attend to web site aesthetics, they fail to provide a theoretical framework of aesthetics. The theoretical construct of aesthetics in website interface design remains poorly understood. Some treated aesthetics as a uni-dimensional construct (Schenkman & Jonsson 2000, van der Heijden 2003, Hall & Hanna 2004), while others advocated that aesthetics is a multi-dimensional concept (Lavie & Tractinsky 2004, Tractinsky et al. 2006). The conceptualization of aesthetics in Web site design remains confusing.

The objectives of this research project are: 1) to propose a two-dimensional structure of Web site aesthetics for e-commerce Web site based on the cognitive-affective framework, 2) to provide a measurement instrument that faithfully applies the concept of aesthetics in Web site design. In order to achieve these objectives, we have reviewed the past literature on aesthetics. In this review, we found that the theories on Web site aesthetics were very limited. Therefore we extend our reviewing scope to broader but relevant fields of aesthetics. In particular, we resort to the theories of aesthetics in environmental psychology and Human-Computer Interaction (HCI). Drawing upon the cognitive-affective framework in attitude theory, we first proposed a two-dimensional structure of Web site aesthetics, and further developed an instrument to measure Web site aesthetics based on the conceptualization of aesthetics as well as previous instruments of aesthetics in related fields. This instrument development employs an item sorting procedure, followed by a laboratory experiment. The proposed two-dimensional structures of Web site aesthetics as well as the instrument provide us with a foundation for future research. In the final part of this paper, our future experiment which aims at investigating the effects of Web site aesthetics dimensions on consumer response across different types of e-commerce Web sites is also briefly introduced.

2 THEORETICAL BACKGROUND

Aesthetics, or beauty, gives blissful pleasure – which is why it is sought after. Pleasing visuals are important for Web site design because they create first impressions which result in a desire to explore further (Jennings 2000). However, aesthetics is a somewhat elusive and confusing construct (Lindgaard et al. 2006). The similarity or overlap between beauty and aesthetics remains undefined; Some assume that aesthetics equates to 'beauty' or 'visual appeal' (Tractinsky et al. 2000), while other researchers began to explore the multi-dimensional structure of aesthetics, including but not limit to visual appeal as the single dimension of aesthetics.

The extant literature on the topic of Web site aesthetics has offered many different definitions as well as terms for aesthetics. Aesthetics and its dimensions have been labelled as "web appearance" (Kim & Stoel 2004), "perceived attractiveness" (van der Heijden 2003), "visual appeal" (Lindgaard et al. 2006), "visual impact" (Demangeot & Broderick 2006), "aesthetics" (Lindgaard & Whitfield 2004), "aesthetic response" (Mathwicka et al. 2001), "aesthetic experience" (Jennings 2000), "design aesthetics" (Cry et al. 2006), or "complexity, order, and legibility" (Rosen & Purinton 2004).

Though the definitions vary in many aspects, there seems to be some consensus on the characteristics of aesthetics in interface design. First, the systematic nature of aesthetics in the visual domain stems from both the underlying common factors and principles upon which it is based. Both the construction and the perception of any object involve certain design elements (e.g., line, color, etc) and principles (e.g., unity, contrast, balance, proportion, etc.) (Veryzer 1993). Solely focusing on display objects, yet

ignoring their combination with other displayed objects on the interface could result in a design failure. Thus, aesthetics is an overall and holistic evaluation concerning both the design principle and individual objects. Second, aesthetics is closely connected to attention and understanding. An aesthetic interface draws user/consumer's attention and makes them sagaciously engaged and immersed in an activity (Jennings 2000). However, an aesthetic Web site not only grabs attention, but also conveys a clear, unique image which helps users/consumers achieve goals of visiting that Web site (Demangeot & Broderick 2006). Aesthetics involves a process whereby a viewer clarifies, intensifies, and interprets events in his/her visual environment.

To better picture Web site aesthetics, a parsimonious and theoretically sound framework is in need. Drawing upon the cognitive-affective framework in attitude theory, the aesthetics theories in environmental psychology and recent literature on aesthetics in Human-Computer Interaction, we propose a two-dimensional Web site aesthetics model which structures the aesthetics into two dimensions: visual appeal and organization. We shall introduce the background theories in the following section.

2.1 The Cognitive-Affective Framework

The attitude psychology defines attitude as a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor (Eagly and Chaiken 1993; Ajzen 2001). Being an overall evaluation of the goodness or badness of an entity, attitude has been conceptualized as having cognitive and affective components. Cognitive evaluation is inferred from thoughts and ideas regarding an entity. It has been recognized by many researchers that evaluative judgments are the result of cognitive processes, which is the assumption inherent in the influencing expectancy-value model (Ajzen 2001). However, some theorists have challenged this assumption by proposing that evaluations may also be controlled by affective process (e.g. the affective primacy hypothesis, Zajonc 1980). Affective evaluation consists of feelings, moods, emotions, and sympathetic nervous system activity that people experience in relation to attitude object (Eagly and Chaiken 1993).

The cognitive and affective component of attitude has been echoed in the consumer attitude research. Zajonc and Markus (1982) highlighted that cognitive evaluation is not only based on the physical attributes, but also based on the interaction with an object. Rajeev and Ahtola (1990) echoed that the utilitarian aspect of an attitude towards a product relates to the usefulness, value, and wiseness of the product as perceived by the consumer; on the other hand, hedonic aspect relates to pleasure experienced or anticipated from the behavior. Then why do consumers evaluate an object in the cognitive and affective aspects? In parallel, the motivation research posits that people have two broad classes of motivation: extrinsic motivation and intrinsic motivation (e.g. Babin et al. 1994). Extrinsic motivation refers to the performance of an activity because it is instrumental in achieving valued outcomes that are distinct from the activity itself. Intrinsic motivation refers to the performance of an activity for its own sake, apart from the consequent reinforcement. Obviously, extrinsic motivation and intrinsic motivation correspond to the cognitive and affective attitude towards an entity. Because people seek to satisfy their motivations, the corresponding evaluations of an entity or activity are engendered.

2.2 Aesthetics in Environmental Psychology Theories

In the domain of environmental psychology, aesthetics can be regarded as a holistic perception of an environment that involves both cognitive and affective psychological evaluations. Two notable aesthetic qualities of environmental psychology, first distinguished by Arnheim (1996), are order and complexity. "Order may be defined as the degree and kind of lawfulness governing the relations among the parts of an entity. Complexity is the multiplicity of the relationships among the parts of an entity (p. 123)" (Arnheim 1966). Order may contribute to the cognitive process in which people evaluate an entity. "Complexity" refers to the amount of the diversity of the visual elements presented

in the scene which people are interested in seeking how much is going on in the scene. Complexity is related to the experience of interaction with the environment. Good design should strive to balance their degrees given the design context. "Complexity without order produces confusion; order without complexity produces boredom (p. 124)" (Arnheim, 1966). The delicate balance between complexity and order suggests that people had two underlying purposes for a certain environment, namely, "making sense" and "involvement". "Making sense" concerns the need to comprehend in the immediate environment. For example, people prefer certain landscape according to how much they can immediately understand what is going on (Kaplan 1979). Making sense involves a cognitive process where people have inherent needs to understand the environment in an efficient and effective way. Involvement concerns the urge of an environment to stimulate thinking and exploration. The more involved an environment is, the more enjoyable it is, and the greater the preference for it. In the later research, Kaplan and his colleagues (1998) named two informational needs as "understanding" and "exploration". Different organizations of the elements and the contents in an environment produce different levels of order and complexity (Kaplan et al. 1998). In summary, in environmental aesthetics research, we summarize the theories and research on visual quality as suggesting two important dimensions in evaluative appraisals of places (Nasar & Hong 1999). One is the need to understand, to make sense, which fall in the cognitive aspect while the other is the need to explore, to be stimulated, which fall in the affective aspect.

2.3 Aesthetics Theories in Human-Computer Interaction

In HCI literature, aesthetics can be also regarded as a holistic perception of a system artefact that involves both cognitive and affective psychological evaluations. Although the theories and findings of aesthetics in environmental psychology are fruitful, the HCI literature is less mature and yet to develop such design concepts. Attempts have been made to apply theories developed in environmental psychology, especially landscape design to web interface design by researchers (e.g. Lavie et al. 2004). Schenkman and Jonsson (2000) asked participants to rate several Web pages on the following dimensions: overall impression, beauty, meaningfulness, comprehension, order, legibility, and complexity. They found that participants apparently grouped Overall Impression, Beauty and Meaningfulness together, which was termed "Appeal" in their study, while Order, Legibility and Complexity were grouped together and named "Formal" factor (Schenkman & Jonsson 2000). Kim and Stoel (2004) identified a dimension of web quality and termed it as "web appearance". Although they treated web appearance as uni-dimensional, their measurement for this construct actually contains two different set of items similar to perceived visual attractiveness and ease of use in van der Heijden (2003)'s study.

One of the most influential works is by Lavie and Tractinsky (2004). Lavie and Tractinsky (2004) proposed two high-level aesthetic related dimensions of web pages, namely, classical aesthetics and expressive aesthetics. Classical aesthetics refers to the orderliness and clarity of the design. This dimension seems conceptually closely relate to the cognitive process of browsing a Web site. However, the authors used items such as 'clean', 'pleasant', 'symmetrical' and 'aesthetic' to represent the conceptual space of this construct. Two potential problems might associate with the operationalization of this dimension. First, both cognitive (clean, symmetrical) and affective responses (pleasant) were included as indicators of this dimension. Second, 'aesthetic' used as an item to measure one dimension of aesthetics is confusing and problematic. The second dimension, expressive aesthetics, refers to the originality, creativity and the richness of the design (Lavie & Tractinsky 2004). This dimension seems to capture users' perceptions of the creativity and originality of the site's design. Expressive aesthetics was represented by the following design attributes: creative, use of special effects, original, sophisticated and fascinating. However, this scale is also not perfect for several reasons. First, this dimension again contains both cognitive and affective responses. Second, the item 'use of special effects' as an indicator of 'Expressive' aesthetics could be problematic because an aesthetic interface does not necessarily use special effects and using special effects does not guarantee this interface to be aesthetic. Therefore, while Lavie et al. (2004)'s study is significant

in the aesthetics studies in Human-Computer Interaction, and provides a good first step towards operationalising aesthetics, they do not resolve the conflict of defining aesthetics clearly and explicitly.

In summary, while many characteristics of aesthetics have been identified in environmental psychology and HCI literature, the extant literature tends to be exploratory rather than confirmatory and theory-driven. A concise framework to conceptualize aesthetics is still lacking. Table 1 presents the mapping of theoretical constructs in literature into cognitive-affective framework.

Cognitive Component	Affective Component	Reference
Order/coherence The degree and kind of lawfulness governing the relations among the parts of an entity.	Complexity/diversity The multiplicity of the relationships among the parts of an entity.	Arnheim 1966.
Making sense The need to comprehend in the immediate environment.	Involvement The need to figure out, to learn, to be stimulated.	Kaplan 1979
Coherence The order and level of direction of attention and how the scene "hangs together"	Complexity The amount of the diversity of the visual elements presented in the scene which people are interested in seeking how much is going on in the scene.	Kaplan 1982, 1989
Formal factor (order, legibility, and complexity)	Appeal factor (overall impression, beauty, and meaningfulness)	Schenkman & Jonsson 2000
Classical aesthetics the orderliness and clarity of the design	Expressive aesthetics The originality, creativity and the richness of the design	Lavie & Tractinsky, 2004
Coherence A reflection of the unity of a scene, where coherence may be enhanced through repeating patterns of colour and texture.	Complexity The diversity and richness of landscape elements and features, their interspersion as well as the grain size of the landscape.	Tveit et al. 2006

Table 1. Mapping of Aesthetics Components in Cognitive-Affective Framework

3 THE TWO-DIMENSIONAL STRUCTURE OF WEB SITE AESTHETICS

Based on the cognitive-affective framework, we therefore propose a two-dimensional model of Web site aesthetics which breaks the overall aesthetics into two dimensions: *visual appeal* and *organization* of interface. The visual appeal of Web site refers to the degree to which a consumer believes that the Web site is pleasing to the eye and stimulates the desire to explore. This dimension captures the affective component of Web site aesthetics. This definition is adapted from van der Heijden (2003)'s definition of Web site attractiveness. To some degree, it corresponds to Lavie and Tractinsky (2004)'s expressive aesthetics which was defined as "the originality, creativity and the richness of the design". Following Arnheim (1966)'s definition on order, organization is defined as the degree of lawfulness governing the relations among the elements of Web site. This dimension captures the cognitive component of Web site. This dimension, to some degree, corresponds to Lavie and Tractinsky (2004)'s classical aesthetics which was defined as "the orderliness and clarity of the design".

Visual appeal and organization together cover almost all characteristics of aesthetics identified in the HCI literature and environmental psychology literature. We distinguish the two dimensions because

they have different theoretical property and may lead to different managerial implications. First, the definition of visual appeal specifies the extent to which fun can be derived from browsing a Web site, while organization of Web site draws attention to pragmatic benefits: improving the online purchasing efficiency and effectiveness. Therefore, visual appeal addresses intrinsic motivation and organization addresses extrinsic motivation. Second, the evaluation of visual appeal involves an affective interaction process and manifests as feeling on evaluation. The organization of Web site contributes to the cognitive process. Third, although the joint effects from visual appeal and organization on consumers' evaluations of overall Web site aesthetics might be obvious in many circumstances, it is highly possible that some consumers rely on one dimension of aesthetics due to individual differences. This is consistent with the prediction of cognitive-affective framework that individuals could be identified as "thinkers" who can be predicted by their beliefs about the attitude of an object, but not by their feelings. The reverse is true for individuals identified as "feelers" (Ajzen 2001). Finally, consumers' tendencies to rely on one dimension of aesthetics could be influenced by the nature of products/services they shop online, namely, hedonic or utilitarian product/service. As Van der Heijden (2004) suggested, the Web serves both utilitarian and hedonic purposes and the nature of the Web sites that people surf determines which belief takes precedence.

4 RESEARCH METHODOLOGY

The purpose of our empirical study is to validate the two-dimensional structure of Web site aesthetics construct as well as developing an instrument to measure this construct. The development scale involved a multistage process. First, initial items reflecting perceptions on Web site aesthetics was developed based on literature review. An item-sorting procedure suggested by Moore and Benbasat (1991) was employed to test the initial item validity. Second, a laboratory experiment designed to capture user's perception on Web site aesthetics was conducted and factor analysis was carried out as Exploratory Factor Analysis (EFA) in SPSS. Finally, based on the data collected from the experiment, Structural Equation Modelling (SEM) was used to examine the convergent validity, discriminant validity, nomological validity, and reliability of Web site aesthetics scale. The instrument was presented in Table 2, which not only includes scale for Web site aesthetics, but also scales with established credentials, perceived usefulness (PU), perceived ease of use (EOU) (Davis 1989), and purchase intention for the purpose of discriminant validity test.

Variable	Item	Description	References
Visual Appeal	VA1	The Web site is pleasing to look at.	Hall & Hanna 2004
	VA2	I like the look and feel of the web site.	Hong & Kim 2004
	VA3	The Web site is visually appealing.	Self-developed
	VA4	The visual design of the Web site is attractive.	
	VA5*	This Web site looks pretty.	
Organization	OR1	The design of Web site is harmonious.	Nasar & Hong 1999
	OR2	The layout of the Web site is intuitive.	Pavlou & Fygenson 2006
	OR3	The Web site has logically organized elements.	Rosen & Purinton 2004
	OR4	The layout of the Web site was designed in a manner I am accustomed to.	Self-developed
Ease of Use	EOU1	Learning to use this Web site would be easy for me.	Koufaris 2002
	EOU2	It is clear and understandable regarding how to interact with this Web site.	
	EOU3	It would be easy for me to become skillful at using this Web site.	

	EOU4	I find this Web site easy to use.	
Perceived Usefulness	PU1	Using this Web site can improve my shopping performance.	Koufaris 2002
	PU2	Using this Web site can increase my shopping productivity.	
	PU3	Using this Web site can increase my shopping effectiveness.	
	PU4*	I find this Web site useful.	
Purchase Intention	INT1	I will do most of my future purchase for [product] with this Web site. [For Hotel Reservation- I will do most of my future hotel reservations with this Web site]	Gefen 2002
	INT2	I will recommend this Web site to friends, neighbors, and relatives.	
	INT3	I will use this Web site the very next time I need to shop. [For Hotel Reservation- I will use this Web site the very next time I need to reserve a hotel room]	
* : Drop after EFA and CFA			

Table 2. Constructs & Measures

4.1 Initial Item Development & Item Sorting

Initial items of the two dimensions of Web site aesthetics were developed by adopting and adapting existing validated scales whenever possible. However, we first filtered those items to keep only those consistent with our conceptualization of aesthetic dimensions. Then the wordings of kept items are adjusted if necessary to fit our conceptualization. Two Information System (IS) researchers review the instrument and check the face validity. An item-sorting procedure was conducted to validate the initial scale. Two focus group interviews were conducted. Each group has four post-graduate students recruited from IS department. In each of the focus groups, an item-sorting process following the procedures suggested by Moore and Benbasat (1991) were first carried out, four participants were asked to sort the items independently. After that, an instruments discussion was conducted, participants were asked to comment on the content, item ambiguity, as well as the wordings of the items. Inter-judge agreements, including raw agreement and Cohen's Kappa were calculated. The Cohen's Kappa scores were .86, .69, .69, .83, .83, and 1 respectively for each pair of judges in the first round, and .88, .74, .88, .86, .73, and .86 respectively for the second round. These scores were greater than 0.65, suggesting acceptable results (Moore and Benbasat, 1991). Revisions were made based on feedback from each round of focus groups.

4.2 Laboratory Experiment

The methodological approach to this study consisted of a laboratory experiment in which student subjects were asked to complete simulated shopping tasks from five real electronic shopping sites. The purpose of using five Web sites was not to test differences between the conditions, but to introduce variance into the experiment by incorporating different types of online shopping Web sites and to ensure that the results of this exploratory study is not biased to one type of stimuli. After subjects completing the shopping task, a survey was administered. Five selected experimental Web sites are introduced in Table 3.

Category/Product sold	URL	Sample size (N)
Electronics-Digital Camera	www.ecost.com	23
Electronics - Notebook	www.dbuys.com	23
Perfume	www.imaginationperfumery.com	21
Flowers	www.1800flowers.com	21
Travelling & Hotel Room Reservation	www.booking.com	44

Table 3. Experimental Web Sites

44 undergarduate students were recruited for this experiment. Each of them was asked to complete three shopping trips from different Web sites (as indicated above). Totally 132 questionnaires were collected. About 65.9% of subjects are males, and 34.1% of them are females. The subjects are relatively young: age mean = 21.9 (s.d. = 2.8). In terms of Internet experience, subjects were quite experienced, with averaged 7.2 years of Internet usage experience (s.d. = 2.0). For online shopping experience, about 34 percept of them had shopped from Internet store for more than 4 times, 38.6% of them had online purchase experience for 1 to 3 times, and 27.3% of them had no online purchase experience.

4.2.1 Exploratory Factor Analysis

In this phase, we examine the data using PCA with Varimax rotation in SPSS (see Table 4). Two dimensions of Web site aesthetics (visual appeal and organization), together with PU, EOU, PI were included in the factor analysis. A total of five factors, with four factors having eigenvalue greater than 1.0, and one factor having an eigenvalue of 0.93. The organization was loaded with Ease of Use. Four constructs explain 76.44 percent of the total variance. While the eigenvalue of the last factor is lower than 1.0, the scree plot (Hair et al., 1998) indicates that the five factors are appropriate. The fifth factor is then manually included for Principle Component Analysis. All constructs (five constructs) explain 81.1 percent of the total variance. The fourth item (PU4) of PU is dispersed over factors. Except for this item, a comparison across factors shows that the remaining items are all loaded on the intended factors. We then drop the PU4 from further analysis.

	Component				
	1	2	3	4	5
VIA1	**0.84**	0.16	0.20	0.17	0.08
VIA2	**0.88**	0.19	0.16	0.14	0.18
VIA3	**0.90**	0.03	0.16	0.19	0.17
VIA4	**0.84**	0.17	0.25	0.12	0.22
VIA5	**0.85**	0.12	0.11	0.05	0.38
ORG1	0.20	0.19	**0.72**	0.14	0.24
ORG2	0.27	0.33	**0.73**	0.10	0.24
ORG3	0.15	0.25	**0.78**	0.29	0.02
ORG4	0.25	0.30	**0.73**	0.17	0.29
EOU1	0.14	**0.88**	0.20	0.19	0.05
EOU2	0.17	**0.82**	0.25	0.24	0.12
EOU3	0.08	**0.72**	0.29	0.38	0.17
EOU4	0.18	**0.75**	0.29	0.25	0.21
PU1	0.10	0.32	0.18	**0.80**	0.09
PU2	0.16	0.20	0.13	**0.88**	0.14
PU3	0.24	0.27	0.20	**0.79**	0.17
PU4	0.22	0.43	0.32	*0.47*	0.25
INT1	0.21	0.03	0.16	0.16	**0.81**
INT2	0.35	0.25	0.27	0.16	**0.76**
INT3	0.37	0.28	0.26	0.17	**0.72**

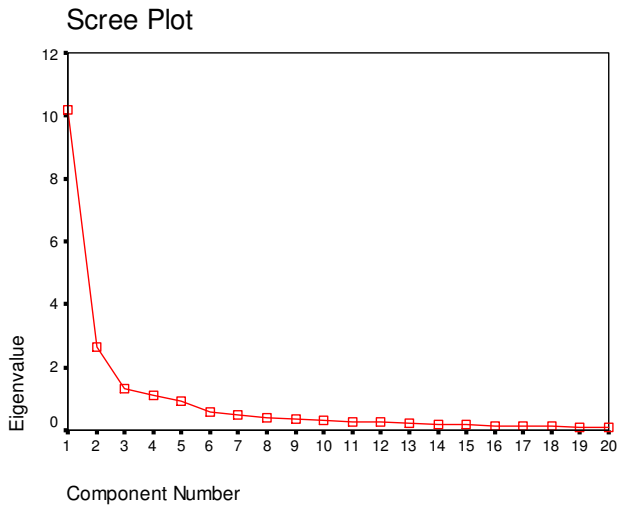

Table 4. Exploratory Factor Analysis Results

4.2.2 Confirmatory factor analysis

The purpose of the measurement model was to further ensure instrument quality. Confirmatory factor analysis (CFA) is recommended as a statistical method (Anderson & Gerbing, 1988) for this purpose. The CFA analysis was conducted by creating a LISREL path diagram. The modification indices suggested that VIA5 was also loaded on INT (purchase intention). The model fit indices were also significantly improved after dropping VIA5. Therefore, after further reviewing the wording of VIA5, we decided to drop VIA5.

After dropping VIA5, we applied the following indices and standards to assess model fit: goodness-of-fit index (GFI), normed fit index (NFI), Non-Normed Fit Index (NNFI) greater than 0.90, adjusted goodness-of-fit index (AGFI) greater than 0.80 (Gefen et al. 2000), comparative fit index (CFI) greater than 0.90, and root mean square of approximation (RMSEA) lower than 0.08 for a good fit and lower than 0.05 for an excellent fit (McKnight & Choudhury & Kacmar 2002). The CFA showed acceptable model fit except for GFI and AGFI (close to the recommended standard): χ^2 / df =2158.79, GFI = 0.85, NFI = 0.90, NNFI = 0.95, AGFI = 0.79, CFI = 0.96 and RMSEA = 0.072.

Convergent validity is the degree to which the items of a given construct are measuring the same underlying latent variable (Kim et al. 2004). Convergent validity is assessed using three criteria. First, standardized path loadings, which are indicators of the degree of association between the underlying latent factor and each item, should be greater than 0.7 and statistically significant (Gefen et al. 2000). Second, composite reliabilities, as well as Cronbach's alphas, should be larger than 0.7 (Nunally 1978). Third, the average variance extracted (AVE) for each factor should exceed 50 percent (Fornel & Larcker 1981). As shown in Table 5, all path loadings are greater than 0.7 and all of them are significant. The reliability measures are all above 0.8, and the AVEs are all above 0.5. Thus, convergent validity is established.

Discriminant validity means the degree to which the measures of two constructs are empirically distinct. We assess discriminant validity with Constrained Confirmatory Factor analysis as suggested by Anderson and Gerbing (1988). For every pair of factors, ordinary CFA is done first. After that, the correlation is set to unity (1.0), and the model is tested again. We use Chi Square difference test to compare the results between the constrained model and the original model. Discriminant validity is established if the Chi Square difference is significant (Anderson & Gerbing 1988). Based on this approach, we conduct pair-wise constrained tests on the two customer groups. The Chi Square differences are found to be all significant, which implies that the Chi Square of the original CFA with its latent variables is significantly better than any possible union of any two latent variables. Hence, discriminant validity is established.

Measures	Std. Loading	T Value	Composite Reliability	AVE	Alpha
VIA1	0.88	12.61	0.946	0.815	0.946
VIA2	0.93	13.87			
VIA3	0.91	13.53			
VIA4	0.89	13.01			
ORG1	0.73	9.49	0.883	0.655	0.882
ORG2	0.85	11.57			
ORG3	0.78	10.24			
ORG4	0.87	12.26			
PU1	0.85	11.75	0.906	0.764	0.902
PU2	0.92	13.30			
PU3	0.85	11.80			

EOU1	0.87	12.44	0.919	0.740	0.959
EOU2	0.88	12.52			
EOU3	0.84	11.70			
EOU4	0.85	11.87			
INT1	0.70	8.73	0.888	0.728	0.937
INT2	0.93	13.58			
INT3	0.91	13.08			

Table 5. Convergent Validity Test

5 CONCLUSIONS & LIMITATIONS

In this study, drawing upon the cognitive-affective framework, a two-dimensional Web site aesthetics model was proposed based on long-established theories in environmental psychology and Human-Computer Interaction (HCI). The validity and reliability of the Web site aesthetics dimensions were verified empirically with exploratory and confirmatory factor analysis. Findings from this study lend support to our conceptualization that Web site aesthetics includes cognitive and affective components in online shopping contexts. While a number of studies have examined the dimensions of aesthetics in environmental psychology (Nasar 1988) and human-computer interaction (Schenkman & Jonsson 2000), this study is one of the few attempts to delineate the dimensions of aesthetics of Web site in online shopping contexts. The results provide evidences that while the visual appeal is traditionally recognized as the most significant dimensions in explaining user's attitude and behaviour, and some studies even use this dimension to represent the whole aesthetics concept (van der Heijden 2003,Cry et al. 2006), the organization component should not be ignored in electronic shopping site's strategy development. Further, this study lays a foundation for future studies on impacts of Web site aesthetics on consumer/user behaviour by providing a theoretical framework and an empirically verified measurement which can be used for various kinds of Web sites in future research. Based on the cognitive-affective framework, the visual appeal dimension represents the affective component while the organization dimension corresponds to the cognitive component of Web site aesthetics. The differential effects of two dimensions of aesthetics on various Web site quality related constructs, such as PU, EOU, and perceived enjoyment could be highly possible.

We should note that this study has certain limitations, as is the case with any exploration of new research venues. First, it should also be pointed out that the relative homogeneous nature of the participants in this study (college students) restricts the generalizability of the experimental results. Obviously, generalization could have been broader if participants had more heterogeneous backgrounds. Further, the sample we used are actually convenience one instead of deriving from a systematic sampling process.

As future study, a laboratory experiment is designed to investigate the impacts of different Web site aesthetics dimensions on consumer response. Two types of Web sites are selected, namely, Web sites selling hedonic products and Web sites selling utilitarian products. Three products belong to each of the two product categories were selected based on a pre-test asking subjects to rate nine products on a think-feel scale (Ratch 1987). Further, a proxy program was developed for this experiment. The defining feature of this program was to transform and relocated elements on web pages by certain rules predefined. Through this program, we can easily manipulate the design of web pages and, at the same time, controlling the web page content. Therefore, based on the validated scale from this study, we are able to investigate the impacts of two Web site aesthetics across various products on online consumer behavior. The intended contribution of this work is to provide a foundation for future research in the area of Web site aesthetics.

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